AMENDMENTS TO THE CLAIMS

This listing will replace all prior versions, and listings, of claims, in the application:

Listing of Claims:

What is claimed is:

1.- 35. (canceled)

36. (withdrawn) A method for fabricating a thermoformable panel comprising the steps of:

a) providing a mat of thermoplastic fibers;

b) heating the mat to a temperature higher than the melting or softening temperature of the plastic material of the fibers having the highest melting or softening temperature; and

c) compressing the mat to such an extent to obtain a 30% to 90% reduction of the starting thickness of the mat.

37. (withdrawn) A method as claimed in claim 36, wherein the fiber mat is made of randomly oriented thermoplastic fibers.

38. (withdrawn) A method as claimed in claim 36 or 37, wherein the fiber mat is made of a plurality of layers of interlaced thermoplastic fibers.

39. (withdrawn) A method as claimed in claim 36, wherein the fiber mat is made of interconnected fabric or nonwoven fabric layers of thermoplastic fibers not being needled.

40. (withdrawn) A method as claimed in claim 36, wherein the fibrous layers are interconnected by mechanical interlacement and/or by physico-chemical bonding, particularly by heat bonding.

41. (withdrawn) A method as claimed in claim 36, wherein the uncompressed fiber mat has a weight of 100 to 4000 g/m^2, preferably of 1000 to 3000 g/m^2.

42. (withdrawn) A method as claimed in claim 36, wherein heating is provided by infrared radiation on the outer faces of the fiber mat immediately before compression.

43. (withdrawn) A method as claimed in claim 36, wherein heating is provided by contact with hot heater elements against the fiber mat immediately before compression and/or during it and/or solely during compression.

44. (withdrawn) A method as claimed in claim 36, wherein the mat is heated to a temperature of 150 °C to 300°C, preferably of 200°C to 250°C for a time varying between and 100 seconds.

45. (withdrawn) A method as claimed in claim 36, wherein a further step of compressing the mat by calendering is provided before heating.

46. (withdrawn) A method as claimed in claim 45, wherein a preheating at a temperature lower than the melting temperature of the fibers is carried out during calendering, the calender rollers being heated rollers.

47. (withdrawn) A method as claimed in claim 36, wherein heating provides a transition in the state of a portion of the thermoplastic fibers from the fibrous state to a at least partially or completely viscous or viscoelastic state for a certain depth of penetration in the thickness of the of the panel starting from at; least one surface of the panel by heating the mat with infrared radiation directed on said surface or surfaces, whereby the plastic material at these depth of penetration in the thickness of the panel has a larger component of plastic material in a viscous or viscoelastic phase as compared with the component plastic material in the fibrous phase, the viscous or viscoelastic component gradually and continuously decreasing toward the median portion of the panel until the distribution of viscous or viscoelastic plastic material and fibrous plastic material is inverted in said median portion, wherein the component of plastic material in the fibrous phase prevails over the component of plastic material in the viscous or viscoelastic phase.

48. (withdrawn) A method according to claim 47, wherein heating provides a transition in the state of a portion of the thermoplastic fibers from the fibrous state to a at least partially or completely viscous or viscoelastic state of a portion of all or almost all the thermoplastic fibers for a certain depth of penetration in the thickness of the of the panel starting from at least one surface of the panel by heating the mat with infrared radiation directed on said surface or surfaces, whereby the plastic material at these depth of penetration in the thickness of the panel has almost only a component of plastic material in a viscous or viscoelastic phase as compared with the component plastic material in the fibrous phase, the viscous or viscoelastic component gradually and continuously decreasing toward the median portion of the panel until the distribution of viscous or viscoelastic plastic material and fibrous plastic material is inverted in said median portion, wherein the component of plastic material in the fibrous phase prevails over the component of plastic material in the viscous or viscoelastic phase or almost only the component of the plastic material in the fibrous phase is present.

49. (withdrawn) A method as claimed in claim 36, further comprising the step of attaching a fabric layer or a thermoplastic net layer, on one or both faces of the fiber mat, when the latter is uncompressed or compressed or during the compression step.

50. (withdrawn) A method as claimed in claim 36, further comprising the step of attaching an adhesive layer on one or both faces of the sheet.

51. (withdrawn) A method as claimed in claim 50, wherein the fabric or net layer and/or the adhesive material are attached during the compression step thanks to the physico-chemical bonding generated as the mat and/or the fabric or the net and/or the adhesive are heated.

52. (withdrawn) A method as claimed in claim 51, wherein the adhesive is provided as a thin sheet and is attached to the fiber mat during the compression step by hot calendering, by feeding it to the calender rollers over the face/s of the fiber mat.

53. (withdrawn) A method as claimed in claim 51, wherein the fabric and/or the net are attached to the fiber mat during the compression step by hot calendering, by feeding them to the calender rollers over the face/s of the fiber mat.

54. (withdrawn) A method as claimed in claim 51, wherein the thin adhesive layer and the fabric and/or the net are attached together, one over the other, and onto the face/s of the mat upon during the calendering step.

55. (withdrawn) A method as claimed in claim 36, wherein the adhesive is applied in powder form, by spreading it over at least one face of the mat in the uncompressed or compressed condition thereof before heating, and by heating said adhesive powder.

56. (withdrawn) A method as claimed in claim 36, wherein it is adapted to produce a thermoformable panel to be used as an intermediate or semi-finished product for the fabrication of formed panels.

57. (withdrawn) A method as claimed in claim 56, wherein the intermediate or semi-finished panel is submitted to thermoforming for producing a shaped panel in the three dimensions.

58. (withdrawn) A method as claimed in claim 57, wherein the panel is heated before forming and or during forming to a softening temperature of the plastic material which is lower that the melting temperature of the thermoplastic fibers and submitted during heating and or after to three dimensional shaping by mechanical compression in a mold and countermold system and/or by compression against a formed surface by using hydraulic and/or pneumatic pressure and/or vacuum against a formed surface and/or by hydraulic and/or pneumatic compression and vacuum.

59. (withdrawn) A method as claimed in claim 36, wherein the mat of fibers is submitted to compression for simultaneous thickness reduction and three dimensional shaping obtaining a three dimensional shaped panel by mechanical compression in a mold and countermold system and/or by compression against a formed surface by using hydraulic and/or

pneumatic pressure and/or vacuum against a formed surface and/or by hydraulic and/or pneumatic compression and vacuum.

60. (withdrawn) A method as claimed in claim 36, wherein before applying a compression for thickness reduction and three dimensional shaping on the heated mat it includes the further steps of:

feeding one or more covering layers for at least one of the sheet faces, one over the other and over the mat or the flat panel to be compressed and/or shaped; and

simultaneously attaching the covering layer/e to the sheet during the compression and/or shaping process.

61. (withdrawn) A method as claimed in claim 60, further comprising the additional step of attaching an adhesive layer on the face/s of the panel and/or of the mat of fibers which adhesive layer: or layers are designed to be coupled to one or more covering layers.

62. (withdrawn) A method as claimed in claim 61, wherein the adhesive consists of a thin thermoplastic layer which is fed and coupled to the panel or mat of fibers on at least one of the two faces thereof before forming and coupling the covering layer/s or while coupling the covering layer/s, the thin layer being fed with the sheet and the covering layers to the forming station.

63. (withdrawn) A method as claimed in claim 36, wherein, before or during the process for compressing and or forming the panel or the mat of fibers and/or the covering layer/s and/or the adhesive layer/s, the sheet and/or the covering layer/s and/or the adhesive layer are heated together with the panel or mat of fibres or separately.

64. (withdrawn) A method as claimed in claim 63, further comprising the step of heating together the mat of fibers and the covering layer/s and/or the adhesive layer to a temperature of 100°C to 300°C, particularly of 160°C to 200°C and for a time of 10 to 100 seconds.

65. (withdrawn) A method claim 36, further comprising the step of coupling the covering layer/s and/or the adhesive layer to the mat of fibers during calendering.

66. - 67. (canceled)

68. (withdrawn) A method as claimed in claim 36, wherein the mat of fibers is heated at different temperatures in different portions of the surfaces of the said mat and/or submitted to different reduction of thickness in different portions of the surface of the mat by compressing the mat in a differential manner in said different portions.

69. (withdrawn) A method as claimed in claim 36, wherein the panel is heated at different temperatures in different portions of the surfaces of the said panel and/or submitted to: different reduction of thickness in different portions of the surface of the said panel by compressing the panel in a differential manner in said different portions during shaping.

70. – 72. (canceled)

73. (withdrawn) A method as claimed in claim 36, wherein it is a method for fabricating interior covering panels for vehicles, particularly automotive vehicles and especially a so-called interior trim for automotive vehicles.

74. (withdrawn) A method as claimed in claim 36, wherein it is a method for fabricating interior or exterior covering panels, for building structures and/or panels for formworks containing concrete or the like.

75. (withdrawn) A method as claimed in claim 36, wherein it is a method for fabricating interior or exterior covering panels or structural elements for ships and/or railway vehicles, especially of the high speed type and/or for aerospace vehicles.

76. (withdrawn) A method as claimed in claim 36, wherein the method steps further comprise:

a) providing a mat of thermoplastic fibers in which only a kind of thermoplastic fibres is comprised or a blend of at least two different kinds of thermoplastic fibres are comprised having

different melting and or softening temperatures, and calendering the mat of thermoplastic fibers while heating it at a temperature lower than the melting and/or softening temperature of the thermoplastic fibers having the highest or the lowest melting and/or softening temperatures or after having heated the mat at the said temperature lower than the melting and/or softening temperature of the thermoplastic fibers having the highest or the lowest melting and/or softening temperatures;

b) heating the mat to a temperature higher than the melting or softening temperature of the thermoplastic fibers having the highest melting or softening temperature by hard or violent heating the panel on one or both faces through infrared radiation directed against the said one or both faces of the panel;

c) compressing the heated mat in a mold having two complementary shaped molding matrices and cooling the panel.

77. (withdrawn) A method according to claim 76, wherein the compression is exercised to such an extent to obtain a 30% to 90% reduction of the starting thickness of the mat.

78. (withdrawn) A process for obtaining an intermediate product for a thermoformable panel comprising interlaced thermoplastic fibers forming a non-woven fabric, wherein a mat of nonwoven thermoplastic fibers is submitted to heating at a temperature which is lower than the softening and/or melting temperature of the thermoplastic material of the fibers having the highest softening and/or melting temperature and is calendered, heating being carried out during or immediately before calendering.

79. (withdrawn) A process for producing an intermediate product f according to claim 78, wherein it comprises the steps of submitting to a violent surface heating a mat of thermoplastic fibres either directly or after preheating at a lower temperature than the softening and/or melting temperature of the thermoplastic material of the fibres having the highest or the lowest softening and/or melting temperature and calendering the said mat of fibres, heating being carried out during or immediately before calendering and molding the said violently heated mat in a mold countermold system having plane and parallel forming surfaces.

80. (withdrawn) A method according to claim 79, wherein the violent heating process and/or the molding step are stopped before obtaining the desired phase distribution of the thermoplastic materials and the desired thickness of the final formed panel.

81 (withdrawn) A method according to claim 80, wherein a final thermoformed panel is obtained from the said flat panel by a further violent heating step and three dimensional shaping step carried out at later stage on starting form the said intermediate flat or plane panel and in such a way as to complete the violent heating step for obtaining the desired distribution of the phase of the thermoplastic material along the thickness of the panel and the desired final thickness of the panel.

82. (withdrawn) A method according to claim 80, wherein the final panel is flat or plane.

83. (withdrawn) A method according to claim 80, wherein the hard or violent heating of the fibres is carried out by violently transferring a certain amount of thermal energy, i.e. heating with a certain temperature of the heaters and for a predetermined time and using heaters which heat transfer mean has a low thermal capacity.

84. (new) A thermoformable panel comprising:

interlaced thermoplastic fibers having one or more melting temperatures; and

a non-woven fabric comprising the interlaced thermoplastic fibers;

wherein substantially all of the interlaced thermoplastic fibers having the one or more melting temperatures are in a fused state at a first face of the panel;

wherein at least some of the interlaced thermoplastic fibers are in a fibrous state within a depth of the panel; and

wherein the interlaced thermoplastic fibers progressively change from the fused state to the fibrous state according to the depth within the panel.

85. (new) The panel of claim 84, wherein substantially all of the interlaced thermoplastic fibers having the one or more melting temperatures are also in the fused state at a second face of the panel substantially parallel to the first face.

86. (new) The panel of claim 85, wherein a greatest percentage of the interlaced thermoplastic fibers in the fibrous state are disposed in a central depth of the panel.

87. (new) The panel of claim 85, wherein a distribution of the interlaced thermoplastic fibers in the fibrous state is symmetrical in relation to the first and second faces.

88. (new) The panel of claim 85, wherein a distribution of the interlaced thermoplastic fibers in the fibrous state is asymmetrical in relation to the first and second faces.

89. (new) The panel of claim 85, wherein a distribution of the interlaced thermoplastic fibers along the depth of the panel is non-linear.

90. (new) The panel of claim 84, wherein the interlaced thermoplastic fibers comprise a polyolefin or a mixture of polyolefins.

91. (New) The panel of claim 84, wherein the interlaced thermoplastic fibers comprise fibers having at least two melting temperatures, and wherein the fibers in the fused state comprise the fibers having the at least two melting temperatures.

92. (new) The panel of claim 91, wherein the interlaced thermoplastic fibers comprise polyethylene, polyethylene ether, polyethylene glycol ether phthalate terpolymers, or copolymers or mixtures thereof.

93. (new) The panel of claim 84, wherein the fused state is caused by molding between 100°C-300°C for 1-200 seconds.

94. (new) The panel of claim 84, wherein the non-woven fabric comprises a mat coupled to one or more nonwoven fabric layers.

95. (new) The panel of claim 94, wherein the mat is coupled by one or more of interlacement or heat bonding.

96. (new) The panel of claim 95, wherein the panel is thermoformed by a process comprising the following steps:

reducing thickness of the non-woven fabric by about 30% to 90%; and

heating between 100°C-300°C for 1-200 seconds.

97. (new) The panel of claim 96, wherein the heating is provided by one or more of radiation, convection, or contact with a hot surface, and wherein the heating comprises molding with a mold/countermold, hydraulic, pneumatic, or vacuum system.

98. (new) The panel of claim 96, wherein the heating comprise a multi-step heating.

99. (new) The panel of claim 97, wherein the multi-step heating is performed at different temperatures.

100. (new) The panel of claim 96, further comprising a step of allowing the non-woven fabric to expand during the heating.

101. (new) The panel of claim 96, further comprising a step of three-dimensional shaping.

102. (new) The panel of claim 94, wherein the non-woven fabric has a weight between 100 and 4000 g/m^2.

103. (new) The panel of claim 94, wherein the mat and the nonwoven fabric layers comprise a plurality of fibers having different melting temperatures, and wherein the fused state is provided by subjecting the nonwoven fabric to heating at a temperature higher than a highest melting temperature of the different melting temperatures.

104. (new) The panel of claim 84, further comprising one or more surface layers coupled to the first or a second face of the panel.

105. (new) The panel of claim 104, wherein the one or more surface layers are coupled by a physico-chemical process.

106. (new) The panel of claim 105, wherein the physico-chemical process comprises a mechanical coupling or adhesive bonding.

107. (new) The panel of claim 106, wherein the adhesive bonding is provided by a polyolefin based polymer or copolymer layer having a treated surface to increase polarity.

108. (new) The panel of claim 84, wherein different portions of the panel have different thicknesses.

109. (new) The panel of claim 108, wherein distribution of the interlaced thermoplastic fibers in the fibrous state is different in the different portions of the panel having the different thicknesses.

110. (new) The panel of claim 84, wherein all of the interlaced thermoplastic fibers having the one or more melting temperatures are in the fused state at the first face of the panel to provide a smooth surface.

111. (new) The panel of claim 84, further comprising a coating layer.

112. (new) The panel of claim 84, wherein the panel has one or more curved surfaces.

113. (new) The panel of claim 112, wherein the panel has an embossed configuration.

114. (new) The panel of claim 84, wherein the panel is configured as an interior trim panel for an automotive application.

115. (new) The panel of claim 84, wherein the panel is configured as an interior or exterior covering panel for a building structure or for a concrete formwork.

116. (new) The panel of claim 84, wherein the panel is configured as an interior or exterior panel or as a structural panel for a ship or a railway vehicle.